

QUALITY ASSURANCE PROJECT PLAN

Phase II Environmental Site Assessment

**Turntable Park and Salt Shed Properties
Stone Cutters Way
Montpelier, Vermont**

July 2004

Prepared for:

**Central Vermont Regional Planning Commission
29 Main Street, Suite 4
Montpelier, Vermont 05602**

Prepared By:

Brownfields Quality Assurance Project Plan

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Site Name: Turntable Park & Salt Shed Properties
Site Location: Montpelier, Vermont

Revision Number: 1
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Form A
Title and Approval Page

QAPP –Phase II Environmental Site Assessment, Turntable Park and Salt Shed Properties, Stone Cutters Way, Montpelier Vermont
Document Title

Rhonda T. Kay, The Johnson Company
Prepared by: (Preparer's Name and Organizational Affiliation)

100 State Street, Suite 600, Montpelier Vermont 05602 (802) 229-4600
Address and Telephone Number

07/08/04
Day/Month/Year

Project Engineer: _____
Signature

Printed Name/Date

Project Manager/QA Officer: _____
Signature

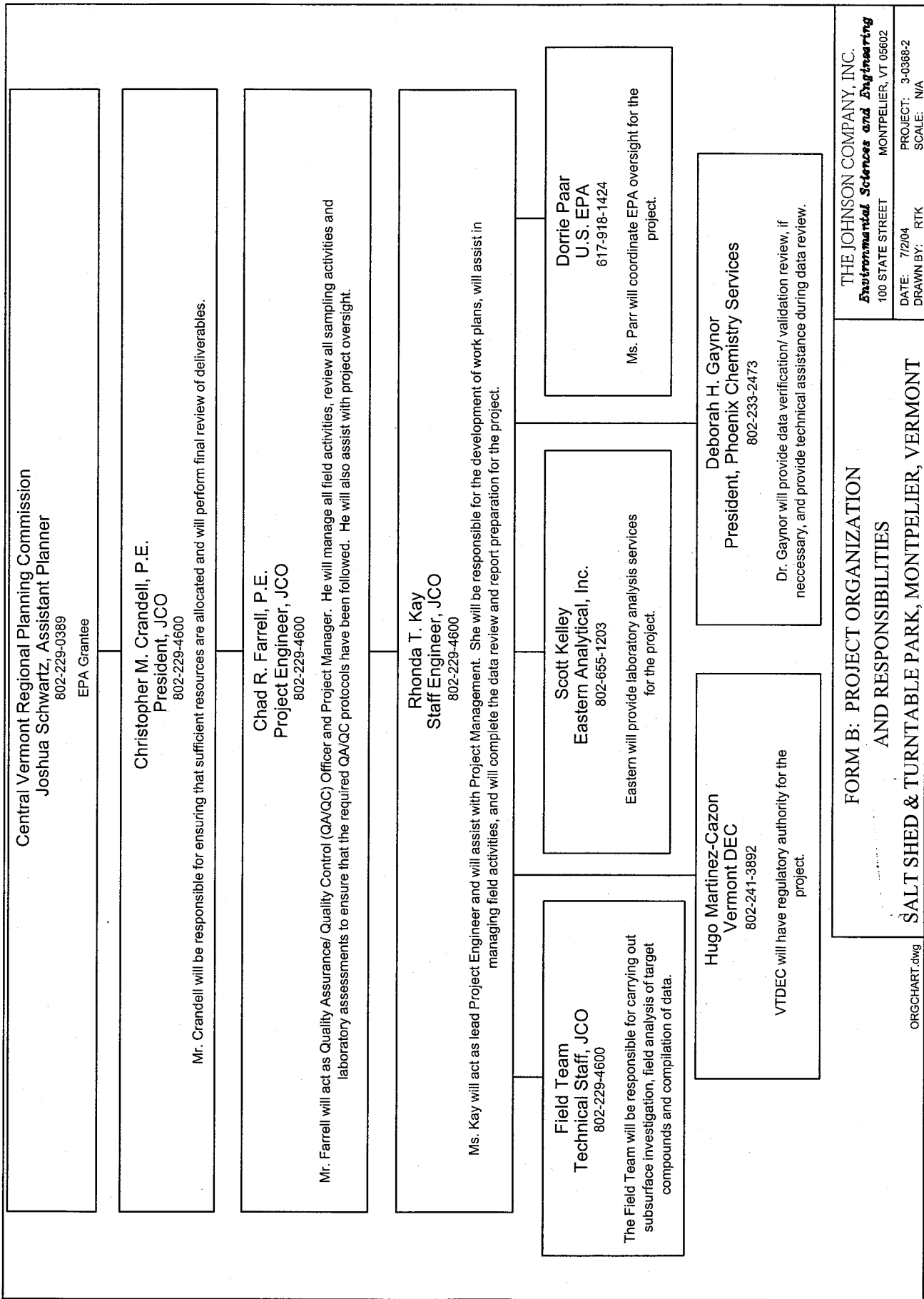
Printed Name/Date

U.S. EPA Project Manager Approval: _____
Signature

Printed Name/Date

U.S. EPA QA Officer Approval: _____
Signature

Printed Name/Date



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Form C

Problem Definition

The Johnson Company was contracted by the Central Vermont Regional Planning Commission (CVRPC) of Montpelier to perform a Phase II Environmental Site Assessment (ESA) at the Turntable Park and Salt Shed properties located on Stone Cutters Way in Montpelier, Vermont (the Site). CVRPC, the Pyralisk Arts Center and the City of Montpelier are working together to redevelop this Site.

The Site is located between the northern bank of the Winooski River and Stone Cutters Way in Montpelier, Vermont (see Figure 1, Site Location Map and Figure 2, Site Orthophoto) and consists of a total area of approximately 1.4 acres. The property is currently zoned as Riverfront District (mainly commercial) and is occupied by a warehouse-style building (the Salt Shed) on the southeast 1.13 acres and the former railway turntable (the Turntable) on the northern 0.27 acres. Both properties are owned by the Vermont Agency of Transportation (VTrans). The Pyralisk Arts Center owns the Salt Shed building but leases the land, and the City of Montpelier holds a long term lease for the Turntable Park property. It is our understanding that the Salt Shed is to be removed and a new building will be built on a similar footprint (using at least part of the existing foundation) to house both the Pyralisk Art Center's performance space and other commercial space. The approximately 20,000 square foot building occupies the majority of the leased Salt Shed property (see Figure 2, Site Sketch Map), and the circular Turntable, with a diameter of 80 feet, occupies the majority of the Turntable Park lot. There is an asphalt parking lot at the southeast end of the Salt Shed property, and the remainder of the Site is covered with tall grasses, with the exception of the steep, brush covered slope along the bank of the Winooski River. Currently used for performance and storage space, the Salt Shed was used in the past as an indoor ice-skating rink and for its original purpose of storing road salt. The Turntable, now out of service, was used to turn railcars and locomotives after they had been repaired in a nearby engine house, which was formerly located to the north of the Site.

The Johnson Company performed Phase I ESAs was completed for the two properties. The purpose of this Phase II ESA is to perform an investigation of the possible existence of recognized environmental conditions associated with the Site due to historical uses of the property and potential impacts related to the surrounding properties. The following is a summary of the recognized environmental conditions discovered during the Phase I ESA process:

- The Site was formerly utilized as a railyard for the City of Montpelier and the local granite industry. While no distinct sources of concern (repair buildings, engine houses, etc.) were indicated to have been located on the Site, it is possible that spillage of hazardous materials and/or petroleum products may have occurred from locomotives and railcars at the Site. Additionally, it is possible that elevated concentrations of metals, polyaromatic hydrocarbons (PAHs), asbestos and pentachlorophenol (PCP) may be present in near-surface soils due to the former presence of locomotives, railcars and treated railroad ties at the Site.
- Although evidence of stained soils was not observed inside the Turntable, the potential exists for historic spills and leakage of lubricating substances and fuels to have impacted the ground surface within the Turntable.

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- An empty, 250-gallon fuel oil tank was observed on the southeast side of the Salt Shed building. Although no ground staining was observed, an odor of petroleum was noted in the vicinity of the tank. As the fill pipe to the tank was closed during the site walkover, the olfactory evidence of petroleum may indicate that fuel oil had been spilled during filling or that the associated piping had leaked.

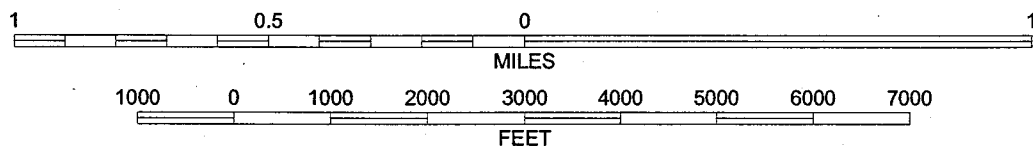
The potential for contamination of soils, soil vapor and groundwater exists throughout the subject area. According to geological maps, the Site is situated on a fluvial deposit of sand and gravel. Although it is unlikely that groundwater at this Site will ever be utilized for drinking water, irrigation or any other purposes where human contact might be experienced, the proximity of the Winooski River provides an impetus to determine whether a source of groundwater contamination exists on the Site.

According to the City of Montpelier's literature, the Turntable Park may be redesigned to include public access into the below-grade area of the Turntable. Additionally, lawn and seating areas will be designed around the perimeter of the Turntable structure. As a result, human contact with soil and soil vapor is possible and potential contamination of these media should be addressed.

A new building, utilizing a similar footprint to the existing Salt Shed, is planned for the Salt Shed property. According to Mr. Fred Connor of Connor Contracting, (redevelopment contractor for the Salt Shed building), the new building will be of slab-on-grade construction with footers extending to depths of approximately five (5) feet below grade. Although this type of construction limits the potential for exposure of the general public to contaminants in the soil, some risk exists for workers during demolition and construction. Also, should contaminated soil vapor exist at the Site, it may affect both construction workers and future building occupants.

Given the potential reuse scenarios for the two Sites, it appears likely that issues pertaining to exposure to contaminated soil and soil vapor contamination at these sites may be of greatest significance. This is due to the fact that groundwater beneath the subject properties is not likely to be used for drinking water, irrigation, or any other purposes where human contact might be experienced. As such, site characterization efforts to evaluate risk associated with redevelopment of the Sites should be focused on an evaluation of the degree of risk of exposure to contaminated soils and soil vapor to human receptors. As mentioned above, given the proximity of the Sites to the Winooski River, the Vermont Department of Environmental Conservation (VTDEC) will also likely be interested in evaluation of the impact of site contaminants, if any, on this nearby sensitive ecological receptor.

In order to evaluate the degree of risk associated with potential contamination within the study area, a dynamic investigation approach will be employed. The Site investigation will include initial sampling efforts for the purpose of collecting soil and soil vapor data not only to identify and preliminarily delineate potential areas of elevated contamination, but also to obtain data regarding risk pathways of concern. A limited groundwater sampling effort will then be conducted to attempt to confirm or deny the presence of contaminants in the immediate vicinity of the river. The overall objective of this initial investigatory effort at the subject properties is to gain the maximum quantity of data possible regarding potential on-site contamination within the financial constraints of the CVRPC's Brownfields Assessment Grant.



CONTOUR INTERVAL = 20 FT

BASE MAP: USGS 7.5 Minute Topographic Quadrangle Montpelier, VT, 1999 and Barre West, VT, 1988.



MAP
LOCATION

**FIGURE 1. SITE LOCATION
SALT SHED & TURNTABLE PARK PROPERTIES
MONTPELIER, VERMONT**

THE JOHNSON COMPANY, INC.

Environmental Sciences and Engineering

100 STATE STREET

MONTPELIER, VT 05602

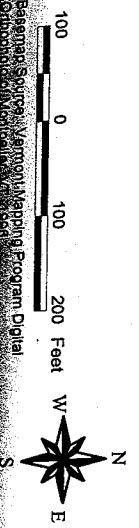


FIGURE 2. SITE ORTHOPHOTO
SALT SHED & TURNTABLE PARK PROPERTIES
MONTPELIER, VERMONT

THE JOHNSON COMPANY, INC.
 Environmental Sciences and Engineering
 100 STATE STREET
 MONTPELIER, VT 05602

DATE: 6/23/04
 DRAWN BY: RTK

PROJECT: 3-0638-1
 SCALE: 1"=200'

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Form D

Project Description

The Scope of Work for this project has been developed in accordance with the US EPA's Triad Approach^a for streamlined brownfield site assessments and cleanups. In following this approach, desired future property usage is considered at the initiation of the investigation by designing the investigation to address risks associated with the specific desired property usage. Innovative, on-site field screening and analytical techniques will be used to allow for minimal field mobilizations and an increased sampling density in comparison with traditional methods. The increased sampling density allowed by the Triad Approach will provide a more complete representation of the environmental quality and a lesser degree of uncertainty associated with potentially missing an area of contaminated media within the two properties. This is considered to be of significant importance at these sites given their history, desired property usage and the absence of any previous subsurface environmental quality data. Finally, the adaptive nature of a site investigation based on the principles of the Triad Approach is well suited for this project. For example, should any hot spots be identified in the field in any of the grid-based sampling locations, the sampling emphasis could be shifted during the investigation to further delineate those areas while the equipment is still in the field.

For the purpose of evaluating potential impact to the Site from both on- and off-site sources, The Johnson Company will conduct subsurface investigations consisting of: a) soil quality sampling; b) soil vapor sampling; and c) groundwater quality sampling. The investigation is designed to evaluate: 1) the potential impact from the historical use of the Site as a railyard; 2) the potential impact from maintenance lubricants or fuels used in the Turntable; 3) the potential impact from a fuel oil aboveground storage tank (AST).

a. Soil Quality Investigation

Near surface soil quality will be addressed to evaluate the potential presence of contamination that might pose a risk from direct exposure to contaminated soils on these sites (e.g., construction workers and future site occupants and visitors). Due to the potential widespread nature of potential contamination from the historical usage of the Site as a railyard as well as the fact that, to our knowledge, no environmental samples have been collected to date, soil samples will be collected from numerous locations across the two sites and analyzed for the potential presence of a number of constituents. Possible hotspots that will be specifically targeted include the vicinity of the AST and the inside of the Turntable. Analyzed constituents will include metals, petroleum-related compounds, (i.e. benzene, toluene, ethylbenzene and xylenes (BTEX)), polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), and pentachlorophenol (PCP). To maximize the number of samples and area of coverage possible for these compounds while also minimizing the analytical costs, field analytical techniques will be employed to the extent possible. These techniques will include the use of an immunoassay testing kit for certain parameters including BTEX, PAHs, PCBs and PCP, and an X-ray fluorescence analyzer for metals. A calibrated photoionization detector will also be used to field screen soil samples for the potential presence of volatile organic compounds (VOCs). Approximately 10% of the field analytical samples will be confirmed by submitting samples for laboratory analysis (this percentage will be slightly less for metals

^a U.S. Environmental Protection Agency, *Using the Triad Approach to Streamline Brownfields Site Assessment and Cleanup; Brownfields Technology Primer Series*, EPA 542-B-03-002, June 2003

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analyses, given the relatively large number of samples that will be possible using the rapid-sampling hand-held XRF).

Since no soil standards exist for the State of Vermont, potential risk from contaminant concentrations in soils will be evaluated through comparison with published federal risk threshold standards such as EPA Region 9 Preliminary Remediation Goals (PRGs) and EPA Region 3 Risk Based Concentrations (RBCs).

b. Soil Vapor Quality Sampling

Soil vapor sampling will be conducted throughout the entire subject area to evaluate potential areas of volatile organic compound (VOC) contamination. Analysis of soil vapor samples is intended to provide data indicative of the degree of risk associated with the migration of volatile vapors into future building interiors and/or affecting visitors to the public park. Similar to the soil quality sampling effort, soil vapor samples will be collected throughout the two properties. In fact, soil vapor sampling will occur in the same locations as the soil coring effort (24 locations across both sites) in order to minimize the time required to advance sampling probes through pavement and/or concrete. An increased density of subjectively selected soil vapor sample locations may be used where historical information provides evidence of potential environmental concern (inside the Turntable and in the vicinity of the AST), or where elevated soil vapor concentrations are encountered in the field.

If field screen results using a photoionization detector (PID) indicate that soil vapor may be of concern, The Johnson Company will collect a total of four (4) analytical soil vapor samples from locations of elevated PID readings. These samples will be submitted for laboratory analysis of VOCs by EPA Method TO-15.

Risk from potential contaminant concentrations in soil vapor at the two subject properties will be evaluated through comparison with published federal risk threshold standards for ambient or indoor air such as EPA Region 9 PRGs and EPA Region 3 RBCs.

c. Groundwater Quality Sampling

As indicated above, it is anticipated that soil and soil vapor contamination are likely to be the primary concerns with respect to redevelopment of these two properties. However, groundwater samples will likely also be required by the VTDEC to evaluate potential impact on the Winooski River by the two subject properties.

In order to minimize the cost associated with groundwater sample collection at these two sites, The Johnson Company proposes the use of our Waterloo Profiler groundwater sample collection system. This method of sample collection saves time and money by eliminating the need to construct permanent monitoring wells. It has been brought to The Johnson Company's attention that boulders, granite chunks and other large pieces of fill may be present at the Site which may complicate the advancement of downhole equipment to depths sufficient for groundwater sample collection. Should these conditions be encountered, it may be necessary to subcontract a qualified company with air rotary drilling capabilities to install traditional monitoring wells. It is anticipated that such conditions would be discovered during the

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soil and soil vapor sampling phases of the project and that alterations to the currently planned approach would be made at that time.

Groundwater sample results will be compared with State of Vermont Groundwater Enforcement Standards (VT GWES).

d. Data Compilation and Reporting

Following completion of on-site investigatory work and receipt of all analytical data, a detailed report for each site will be prepared. We will include summaries of Phase I findings, sample collection activities, results of field screening and laboratory analyses, site and area maps, soil boring completion logs and field notes. The reports will also contain recommendations for future remediation tasks that may be necessary to redevelop these two properties for their desired usage.

Project Timeline

The following table is provided as a summary of the anticipated timeline for this project.

Activities	Activity Start	Activity End
VTDEC Work Scope Approval	07/09/04	07/29/04
EPA QAPP Approval	07/09/04	07/29/04
Soil Quality Sampling and Soil Vapor Sampling	08/02/04	08/04/04
Groundwater Sampling	08/04/04	08/04/04
Field Analysis of Soil Samples	08/02/04	08/04/04
Laboratory Analysis of Soil, Soil Vapor and Groundwater Samples	08/06/04	08/17/04
Reporting	08/16/04	08/20/04

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Form E **Sampling Design**

The Phase II Site assessment will include collection of soil, soil vapor and groundwater samples from locations at the Site as shown in Figure 3.

a. Soil Quality Investigation

In order to obtain adequate site coverage to minimize the uncertainty associated with missing areas of potential impact, a total of 15 soil sampling locations are tentatively proposed for the Salt Shed property and a total of 9 soil sampling locations are proposed for the Turntable Park property (see Figure 3 – Proposed Sampling Locations). These sampling locations include numerous points within the existing Salt Shed Building and numerous locations within the existing railroad turntable. The Johnson Company's A300 Ingersoll Rand truck-mounted drill rig will be utilized for all soil boring locations with the exception of those within the turntable, where a hand auger, jackhammer, or portable auger device will be used to collect soil samples. Composite samples will be collected from depth intervals of 0 to 2 feet and 2 to 4 feet below ground surface in each location. It should be noted that the total depth at locations inside and adjacent to the Salt Shed will extend to 5 feet in order to evaluate conditions at terminal footing depths. As a result, a total of 24 soil samples are anticipated to be collected for analysis from the two properties for evaluation and quantification of the presence of five separate compound types (total BTEX, total PAHs, PCBs, PCP and metals). It should be noted that due to volatilization issues, BTEX samples will NOT be composited, but rather will be collected from locations within the soil core that exhibit the highest reading using a calibrated photoionization detector (PID).

Soil samples will be collected by advancing stainless steel soil core tubes equipped with clear butyrate liners to desired sampling depths. A boulder blaster and/or auger device will be required in sampling locations covered by asphalt and/or concrete. Core tubes will be installed in either two- or five-foot intervals using DPT apparatus. If sampling via DPT methods proves difficult as a result of on-site conditions, The Johnson Company's drill rig can be modified in the field to collect soil samples via hollow stem auger and split spoon techniques.

Samples will be collected from each soil boring for analysis in the field using a Strategic Diagnostics Inc (SDI) RaPID Assay® system for enumeration of the potential presence of BTEX, PAHs, PCBs, and PCP. Numerous field immunoassay samples will be duplicated for quality assurance purposes. The presence of metals will also be analyzed in the field through the use of an Innov-X Systems portable X-ray fluorescence (XRF) analyzer. In addition to measuring bagged core samples for metals with the portable XRF, 25 to 30 additional surface soil samples will also be field-analyzed for the potential presence of metals.

Approximately 10% of the field analytical samples will be confirmed by submitting samples for laboratory analysis (this percentage will be slightly less for metals analyses, given the relatively large number of samples that will be possible using the rapid-sampling hand-held XRF). The Johnson Company will strive to follow the EPA recommendation for confirmatory samples which indicates that 5% of all confirmatory samples come from "dirty" locations, 80% of all confirmatory samples come from "uncertain" locations and 15% of all confirmatory samples come from "clean" areas. Confirmatory soil samples will be placed

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in chilled ice coolers and transported under chain of custody protocol to Eastern Analytical Laboratory in Concord, New Hampshire for analysis.

Soil sample locations will be measured in the field using GPS and/or traditional surveying methods and plotted onto a Sampling Plan. All soil sample locations will be filled with bentonite pellets upon completion. Samples collected from locations covered by asphalt will be completed with an asphalt cold patch.

b. Soil Vapor Quality Sampling

Sampling locations are indicated on Figure 3. Soil vapor points are expected to be installed at or immediately next to soil sampling locations. Samples will be obtained by installing screened drive point samplers to depths of approximately five (5) or six (6) feet below ground surface (bgs) to evaluate the degree of risk associated with potentially contaminated soil vapor below a future building and/or in locations of possible subsurface excavation. Drive point samplers will be installed using either a hand-operated jackhammer or truck-mounted vibratory drive point technology (DPT) apparatus. The ground surface at the point of intrusion will be sealed around the probe by packing moist bentonite around the probe to reduce the potential for short-circuiting and drawing atmospheric air into the sampler. Copper or Teflon tubing will be attached to the sample point and extended to the ground surface. The tubing will be sealed at the surface until sampling is conducted. Samples will be collected via PID calibrated to a benzene reference standard with 100 parts per million (ppm) isobutylene. It is anticipated that a total of 15 soil vapor sampling locations will be completed at the Salt Shed property and a total of 9 soil vapor sampling locations will be completed at the Turntable Park property.

If PID readings indicate that soil vapor may be of concern, The Johnson Company will collect a total of four (4) analytical soil vapor samples from locations of elevated PID readings. These samples will be submitted for laboratory analysis of VOCs by EPA Method TO-15. Analytical soil vapor samples will be collected using vacuum-activated summa canisters preset to collect instantaneous samples. Samples will be transported in a chilled cooler under chain of custody protocol to Severn Trent Services laboratory in Colchester, Vermont for analysis of VOCs by EPA Method TO-15. One trip blank sample will also be analyzed. Sample locations (as well as other pertinent site features) will be located and plotted onto a Sampling Plan using either Global Positioning System (GPS) technology or traditional surveying methods.

c. Groundwater Quality Sampling

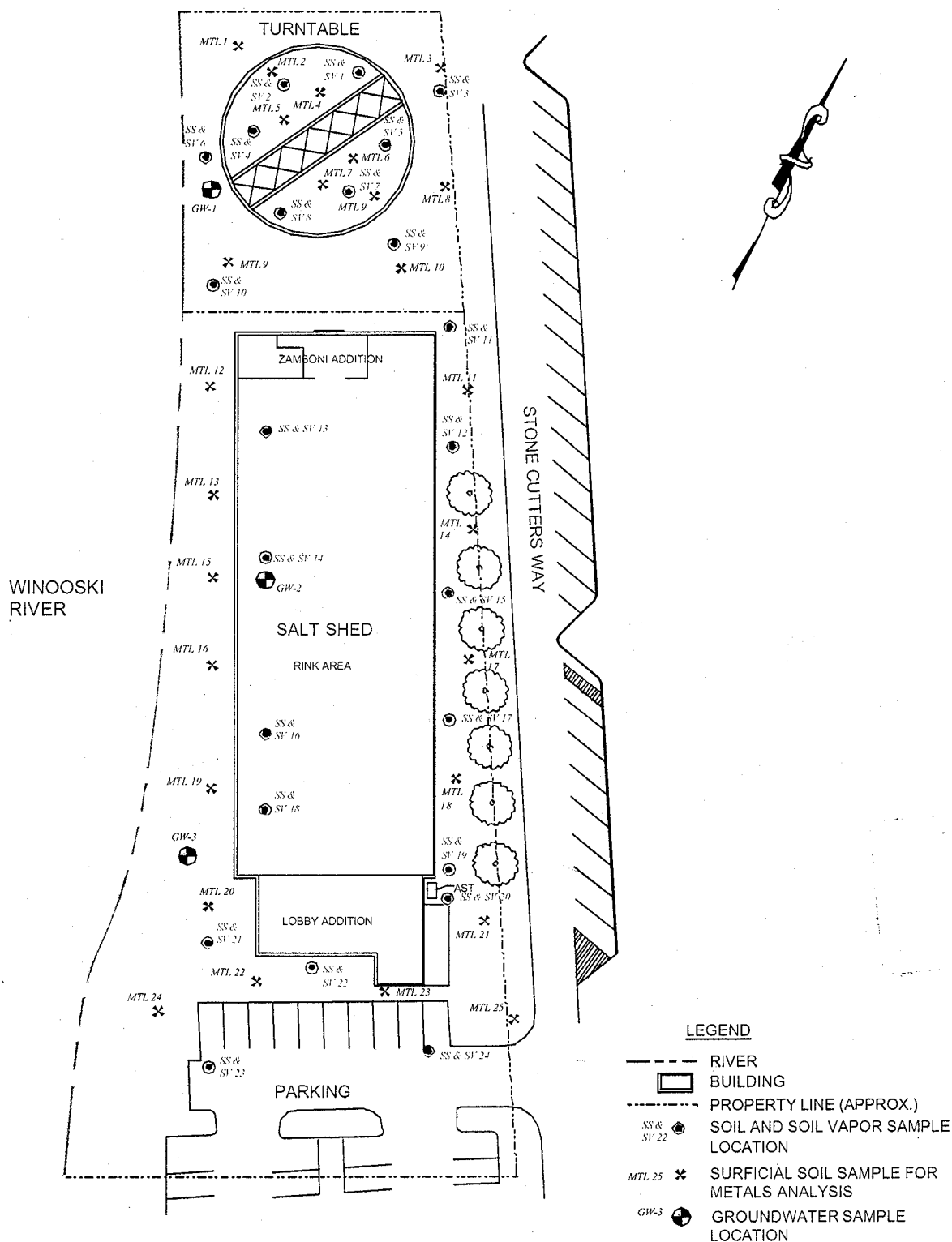
In order to minimize the cost associated with groundwater sample collection at these two sites, The Johnson Company will use the Waterloo Profiler groundwater sample collection system. Using this method, Johnson Company scientists will be able to advance a groundwater sampling point to a depth just below the water table (understood to be located at approximately 15 feet bgs) and collect a sample without installing a well. Peristaltic pumps will be used to collect groundwater samples in accordance with EPA Low Flow Sample Collection methodology. Field parameters including dissolved oxygen, pH, temperature, specific conductivity and oxidation-reduction potential (ORP) will be monitored with a calibrated flow through cell (YSI Model 610XL) prior to sample collection to ensure parameter stabilization and, thus, that a representative groundwater sample is obtained. It is anticipated that two (2)

Form E (continued)

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groundwater sampling locations for the Salt Shed property and one (1) location at the Turntable Park property will be sufficient to indicate potential risk of contaminated groundwater impact on the Winooski River. Given the site use history, analysis of groundwater samples will be limited to PAHs and VOCs. If elevated metals are detected during field sampling efforts with the XRF, then groundwater samples will also be analyzed for dissolved metals. Samples will be placed in chilled ice coolers and transported along with a trip blank and field duplicate sample under chain of custody protocol to Eastern Analytical Laboratory in Concord, New Hampshire for analysis.



**FIGURE 3. PROPOSED SAMPLING LOCATIONS
SALT SHED & TURNTABLE PARK PROPERTIES
MONTPELIER, VERMONT**

THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering
100 STATE STREET MONTPELIER, VT 05602

DATE: 7/22/04
DRAWN BY: RTK

PROJECT: 3-0368-1
SCALE: 1" = 60'

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Form F-1
Method and SOP Reference Table

Analytical Method Reference: Include document title, method name/number, revision number, date	
No.	Method Name
1a	EPA SW-846 Method 8260B, Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry, 3 rd Edition, Update IIB, 12/96
2a	EPA SW-846 Method 8270C, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), Rev. 3, 12/96
3a	EPA SW-846 3 rd Edition, Method 8082, Polychlorinated Biphenyls (PCBs) by Gas Chromatography, Rev 0, 12/96
4a	EPA SW-846, Update III, Method 6010B, Inductively Coupled Plasma-Atomic Emission Spectrometry, Rev 2, 12/96 and Update IVA, Method 6010C
5a	EPA SW-846, 3 rd Edition, Update III, Method 6020, Inductively Coupled Plasma-Mass Spectrometry, Rev 0, 09/94 and Update IVA, Method 6020A
6a	Compendium Method TO-15, Determination of Volatile Organic Compounds in Ambient Air using Specially Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry, 01/99
7a	EPA SW-846 Method 4010A Screening for Pentachlorophenol by Immunoassay, Rev 1, 12/96
8a	EPA SW-846 Method 4020 Screening for Polychlorinated Biphenyls by Immunoassay, Rev 0, 12/96
9a	EPA SW-846 Method 4030 Soil Screening for Petroleum Hydrocarbons by Immunoassay, Rev 0, 12/96
10a	EPA SW-846 Method 4035 Soil Screening for Polynuclear Aromatic Hydrocarbons by Immunoassay, Rev 0, 12/96
11a	EPA SW-846 Method 6200 Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment, Rev. 0, 1/98
12a	EPA Method 600/R-93/116, Method for the Determination of Asbestos in Bulk Building Materials. July 1993.

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Form F-1 (continued)
Method and SOP Reference Table

Project Analytical Standards of Practice (SOPs): Include document title, date, revision number, and originator's name	
No.	Analytical SOP Name
1b	EAI SOP: QA580006, Standard Operating Procedure Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry, 1/28/04, Rev 6, Eastern Analytical, Inc.
2b	EAI SOP: QA41500_07 Standard Operating Procedure Acid/Base/Neutral Extractable Compounds, 2/11/04, Rev 7, Eastern Analytical, Inc.
3b	EAI SOP: QA45625_7 Standard Operating Procedure Method 625/8270C Aqueous Sample Extraction by Separatory Funnel, 1/28/04, Rev 7, Eastern Analytical, Inc.
4b	EAI SOP: QA 45002_02 Standard Operating Procedure Methods 8081A and 8082 Solid Sample Extraction by Ultrasonic Sonication EPA Method 3550B, 1/28/04, Rev 2, Eastern Analytical, Inc.
5b	EAI SOP: QA 41500_08 Standard Operating Procedure Method 8270 Solid Sample Extraction by Ultrasonic Sonication EPA Method 3550B, Rev 8, 1/28/04, Eastern Analytical, Inc.
6b	EAI SOP: QA45608_4 Standard Operating Procedure Pesticide/PCB Analysis EPA Method 608 and SW 846 Methods 8081A and 8082, 2/05/04, Rev 4, Eastern Analytical, Inc.
7b	EAI SOP: QA201005_ICP6010B_6010C Standard Operating Procedure Inductively Coupled Plasma Atomic Emission Spectroscopy, 1/16/04, Rev 5, Eastern Analytical, Inc.
8b	EAI SOP: QA292003_6020_6020A Standard Operating Procedure Inductively Coupled Plasma-Mass Spectrometry, 1/15/04, Rev 3, Eastern Analytical, Inc.
9b	EAI SOP: QA230004_MicroDigS_3051_3051A Standard Operating Procedure Microwave Digestion-Solids, 1/16/04, Rev 4, Eastern Analytical, Inc.
10b	SOP No. LM-AT-TO15, Standard Operating Procedure for the Determination of Volatile Organic Compounds In Air by (GC/MS) Analysis, 02/12/03, Rev. 4, Severn Trent Laboratories and SOP Change-in-Progress Attachment (Date Effective 6/10/04)
11b	US EPA, The Protocol for Screening Soil and Sediment Samples for Asbestos Content Used by the US EPA Region 1 Laboratory, December 5, 1997.

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Method and SOP Reference Table

Project Sampling Standards of Practice (SOPs): Include document title, date, revision number, and originator's name	
No.	Sampling SOP Name
1c	SOP-JCO-003 Standard Operating Procedure of Monitoring Well Installation and Construction, 6/94, Rev 5, The Johnson Company, Inc.
2c	SOP-JCO-007 Standard Operating Procedure for Chain-of-Custody Records, 3/96, Rev. 6, The Johnson Company, Inc.
3c	SOP-JCO-008 Standard Operating Procedure for Groundwater Sampling of Monitoring Wells: Water Quality, 7/94, Rev 4, The Johnson Company, Inc.
4c	SOP-JCO-018 Standard Operating Procedure for Deviation from Protocols or Standard Operating Procedures and for Notation, Correction, and Documentation of Unforeseen Circumstances, 7/94, Rev. 1, The Johnson Company, Inc.
5c	SOP-JCO-021 Standard Operating Procedure for Soil Sampling for Volatile Organic Compounds using Methanol Preservation, 1/04, Rev. 3, The Johnson Company, Inc.
6c	SOP-JCO-026 Standard Operating Procedure for Soil, Sediment, and Sludge Sampling and Analysis for Semi-Volatile Organic and Inorganic Components, 7/94, Rev 2, The Johnson Company, Inc.
7c	SOP-JCO-027 Standard Operating Procedure for Decontamination of Field Equipment, 3/96, Rev. 4, The Johnson Company, Inc.
8c	SOP-JCO-029 Standard Operating Procedure for Construction and Use of the Mini-Piezometer, 3/12/91, Rev 1, The Johnson Company, Inc.
9c	SOP-JCO-034 Standard Operating Procedure for Use of Field Log Books, 3/96, Rev. 3, The Johnson Company, Inc.
10c	SOP-JCO-036 Standard Operating Procedure for Geologic Description of Sediments, 12/99, Rev 1, The Johnson Company, Inc.
11c	SOP-JCO-39 Standard Operating Procedure for Headspace Analysis: Volatile Organic Compounds, 3/91, Rev 1, The Johnson Company, Inc.
12c	SOP-JCO-041 Standard Operating Procedure for Calibration and Operation of the Thermal Environmental Instruments, Inc., Model 580B OVM® Photo-Ionization Detector, 3/97, Rev. 2, The Johnson Company, Inc.
13c	SOP-JCO-051 Standard Operating Procedure for Ambient Air Sampling for VOCs with Summa Passivated Canisters EPA Method TO-14, 8/94, Rev. 1, The Johnson Company, Inc.
14c	SOP-JCO-053 Standard Operating Procedure for Low Stress Groundwater Sampling of Monitoring Wells and Piezometers, Rev 1, 5/97, The Johnson Company, Inc.
15c	SOP-JCO-055 Standard Operating Procedure for Calibration and Use of the YSI Model 610XL, Rev 0, 6/03, The Johnson Company, Inc.
16c	SOP-JCO-056 Standard Operating Procedure for Immunoassay Analysis Using SDI RaPID Assay Apparatus, 5/03, Rev 1, The Johnson Company, Inc.

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Form F-1 (continued)
Method and SOP Reference Table

Project Sampling Standards of Practice (SOPs): Include document title, date, revision number, and originator's name	
17c	SOP-JCO-058 Standard Operating Procedure for Use of Innov-X Hand-Held X-Ray Fluorescence (XRF) Sampling Device, 6/03, Rev 1, The Johnson Company, Inc.

*Project Sampling SOPs include collection, sample preservation, equipment decontamination, preventive maintenance, etc.

Form F-2
Sampling and Analytical Methods Requirements

Matrix	Parameter	Number of Samples (include field QC)	Analytical Method*	Sampling SOP*	Containers per Sample (number, size and type)	Preservation Requirements (temperature, light, chemical)	Maximum Holding Time
Soil	Total BTEX – field	48 samples, 10-12 duplicates	EPA 4030	5c, 16c	Glass jar with Teflon-lined cap	4° C ± 2° C	Analyze on-site
Soil	Metals** – field	75-100 samples	EPA 6200	6c, 17c	N/A	N/A	Analyze on-site
Soil	PAH – field	48 samples, 10-12 duplicates	EPA 4035	6c, 16c	250 ml widemouth glass jar with Teflon-lined lid	4° C ± 2° C	Analyze on-site
Soil	PCB – field	48 samples, 10-12 duplicates	EPA 4020	6c, 16c	250 ml widemouth glass jar with Teflon-lined lid	4° C ± 2° C	Analyze on-site
Soil	PCP – field	48 samples, 10-12 duplicates	EPA 4010A	6c, 16c	250 ml widemouth glass jar with Teflon-lined lid	4° C ± 2° C	Analyze on-site
Soil	Metals** – laboratory	6 samples, 1 duplicate	EPA 6010B or EPA 6020	6c	600 ml polyethylene or fluorocarbon (PFE or TFA) container	4° C ± 2° C	6 months, 28 days for mercury
Soil	PCBs – Laboratory	6 samples, 1 duplicate	EPA 8082	6c	250 ml widemouth glass jar with Teflon-lined lid	4° C ± 2° C	Extract within 14 days, analyze within 40 days
Soil	SVOCs – laboratory	6 samples, 1 duplicate	EPA 8270C	6c	250 ml widemouth glass jar with Teflon-lined lid	4° C ± 2° C	Extract within 14 days, analyze within 40 days
Soil	VOCs – laboratory	6 samples, 1 duplicate	EPA 8260B	5c	2 x 40 ml glass VOA vials prepreserved with methanol	4° C ± 2° C, 5 ml methanol: 5 gram soil	14 days

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Soil	Asbestos - laboratory	24 samples, 2 duplicates	EPA 600/R-93/116	6c	Glass jar or ziploc baggie (minimum of 2 oz)	N/A	None
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Form F-2 continued
Sampling and Analytical Methods Requirements

Matrix	Parameter	Number of Samples (include field QC)	Analytical Method*	Sampling SOP*	Containers per Sample (number, size and type)	Preservation Requirements (temperature, light, chemical)	Maximum Holding Time
Soil Vapor	VOCs – field	24 samples	Hand-held photoionization detector	12c	N/A	N/A	N/A
Soil Vapor (if necessary)	VOCs – laboratory	0 to 4 samples, 1 trip blank	EPA TO-15	13c	SUMMA® canister with pre-calibrated flow controller	Ambient temperature	30 days
Groundwater	VOCs – laboratory	3 samples, 1 duplicate, 1 trip blank, 1 equipment blank	EPA 8260B	3c	2 x 40 ml glass VOA vials with Teflon-lined septum	1:1 HCl, 4° C ± 2° C	14 days
Groundwater	PAHs - laboratory	3 samples, 1 duplicate, 1 equipment blank	EPA 8270C	3c	1 liter amber jar with Teflon-lined screw cap	4° C ± 2° C	Extract within 7 days, analyze within 40 days
Groundwater	Metals (if necessary) - laboratory	3 samples, 1 duplicate, 1 equipment blank	EPA 6010B or EPA 6020	3c	250 ml plastic jar	1:1 HNO ₃	6 months

* Form F-1 contains Method and SOP Reference Tables.

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** Metals targeted for analysis by EPA Method 6010B include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, tin, vanadium, and zinc. EPA Method 6020 will detect all of the above-listed metals, as well as mercury.

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Form G
Preventive Maintenance - Field Equipment

Instrument	Activity	Frequency	SOP ref.*
ThermoEnvironmental Model 580B OVM	Clean lamp and unit	Monthly or as needed when unit shows evidence of problems	12c
SDI Analyzer	Perform self-test	Daily upon start up	15c
XRF	Inspection of Kapton film covering of analyzer window	Daily	16c

*Form F-1, contains the SOP Reference Table.

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Form H
Calibration and Corrective Action - Field Equipment

Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action	SOP Ref*
ThermoEnvironmental Model 580B OVM	Calibration for VOCs with 100 ppm isobutylene standard	At least once daily, more often if response is slow	$\pm 2\%$	Rezero and recalibrate with 100 ppm isobutylene	12c
SDI Analyzer	Calibration with compound-specific stock standard solutions	Every sample run	$R^2 > 0.9$ for standard curve	Rerun samples	15c
Innov-X Systems Handheld XRF	Calibration	N/A – unit comes factory calibrated	N/A	N/A	N/A
YSI Model 610XL	Calibration	At least once daily	DO = 0 in zero solution; pH = 4.00 and 7.00 in calibration solutions; conductivity = conductivity standards for 30 seconds	Recalibrate	15c

* Form F-1, contains the SOP Reference Table.

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Form I
Preventive Maintenance - Laboratory Equipment

Instrument	Activity	Frequency	SOP ref.
GC/MS	Per manufacturer's instructions and laboratory quality assurance documentation	Per manufacturer's instructions and laboratory quality assurance documentation	N/A
GC	Per manufacturer's instructions and laboratory quality assurance documentation	Per manufacturer's instructions and laboratory quality assurance documentation	N/A
ICP	Per manufacturer's instructions and laboratory quality assurance documentation	Per manufacturer's instructions and laboratory quality assurance documentation	N/A
ICP-MS	Per manufacturer's instructions and laboratory quality assurance documentation	Per manufacturer's instructions and laboratory quality assurance documentation	N/A

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Form J
Calibration and Corrective Action - Laboratory Equipment

Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action	SOP Ref*
GC/MS	Initial calibration with stock standards	After preventative maintenance or when CV compounds outside criteria	5-6 point calibration correlation coefficient must be 0.995 or higher using a linear curve fit; second source standard must be within $\pm 15\%$	Establish new calibration curve or service instrument	1b, 10b
GC/MS	Continuing calibration verification with stock standards	Every 12 hours	Confirm retention times and integrations for each compound; all compounds with an Average Response Factor curve fit must have CV response factor within $\pm 20\%$ drift; system performance check compounds minimum R.F. 0.3	Establish new calibration curve or service instrument	1b, 6b, 10b
GC	Initial calibration with stock standards	After preventative maintenance or when CV compounds outside criteria	5-6 point calibration correlation coefficient must be 0.995 or higher using a linear curve fit; second source standard must be within $\pm 15\%$	Establish new calibration curve or service instrument	6b
GC	Continuing calibration verification with stock standards	Every 10 injections or every 12 hours, or at beginning & end of each batch	Confirm retention times and integrations for each compound; all compounds with an Average Response Factor curve fit must have CV response factor within $\pm 15\%$ drift; system performance check compounds minimum R.F. 0.3	Establish new calibration curve or service instrument	6b
ICP	Initial instrument calibration	Initiation of each run	Initial calibration standards must be within $\pm 10\%$ recovery; recovery of interference check standards must be within $\pm 20\%$; the linear dynamic range recovery must be within $\pm 10\%$ linearity; low level calibration checks must be within $\pm 20\%$	Establish new calibration curve or service instrument	7b

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ICP	Continuing calibration verification	Every 10 samples and at the end of each run	Results must agree within $\pm 10\%$ of the expected value; results of calibration blank must be less than reporting limit	Terminate analysis, correct problem, recalibrate, reanalyze previous 10 samples	7b
ICP-MS	Initial instrument calibration	Initiation of each run	Second source standard solution must be within $\pm 10\%$ of value	Establish new calibration curve or service instrument	8b

Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action	SOP Ref*
ICP-MS	Continuing calibration verification	Every 10 samples and at the end of each run	Results must agree within $\pm 10\%$ of the expected mid-range value; results of calibration blank must not be higher than half the reporting limit; detection limit check standard must have $\pm 30\%$ recovery; linearity check standard must be within $\pm 10\%$ of intended concentration	Terminate analysis, correct problem, recalibrate, reanalyze previous 10 samples	8b

* Form F-1, contains the Method and SOP Reference Table.

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Form K
Sample Handling and Custody Requirements

As described in Project Sampling SOP 2c, the chain-of-custody record allows for the tracking of possession and handling of individual samples from the time of field collection through laboratory analysis. All samples released from field operations shall be accompanied by a completed Chain-of-Custody Form (see attached). This is done to ensure the legal integrity of the sample materials collected. Every effort shall be made to keep as few people as possible in the chain of sample possession.

Labels will be affixed to each sample container with the following information: sample ID, site location, date, time, sampler's initials, type of analysis required, and preservative used. See examples attached.

The sample shipping container shall be sealed with chain-of-custody tape, containing the date and sampler's signature. The custody tape is especially important when shipping the container via overnight courier such as Federal Express and United Parcel Service. See attached example.

All samples will be carefully packed in coolers with bubble wrap or other suitable packaging material to avoid breakage. The coolers will also be packed with bagged ice to maintain a temperature of 4°C in the cooler. A temperature blank will be provided with each cooler to verify the cooler temperature upon arrival to the lab. A trip blank will accompany each cooler from the laboratory through the field sample collection period and back to the laboratory to verify sample integrity.

All waste sample material will be disposed of by the analytical laboratory in accordance with all state and federal regulations.

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Reorder From NEBS CUSTOM[™], printing service 1-800-868-6327 NEBS Inc. Portsmouth, NH 03458 www.nebs.com

WHITE - To accompany sample to the lab and returned to the Johnson Co. **YELLOW** - Lab copy **PINK** - Transporter copy **GOLD** - Sampler copy

100 State Street
Montpelier, VT 05602
(802) 229-4600

THE JOHNSON COMPANY, INC.
Signature: _____

Date: _____ C.O.C. No: _____

THE JOHNSON COMPANY, INC.

Environmental Sciences and Engineering

Site:

Date:

Sample:

Time:

Analysis:

Preservative:

Collected by:

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Form L
Analytical Precision and Accuracy

Analyte	Analytical Method*	Detection Limit (water/soil) (units)	Quantitation Limit (water/soil) (units)	Precision (water/soil)	Accuracy (water/soil)
Total BTEX – field	EPA 4030	0.02 ppm (in extraction)	0.9 ppm (in soil)	Refer to SOP-15c	Refer to SOP-15c
Metals** – field	EPA 6200	Refer to SOP-16c	Refer to SOP-17c	Refer to SOP-17c	Refer to SOP-17c
PAH – field	EPA 4035	Refer to SOP-15c	Refer to SOP-16c	Refer to SOP-16c	Refer to SOP-16c
PCB – field	EPA 4020	0.02 ppb as Aroclor 1254 (in extraction)	0.5 ppm as Aroclor 1254 (in soil)	Refer to SOP-15c	Refer to SOP-15c
PCP – field	EPA 4010A	0.06 ppb (in extraction)	0.1 ppm (in soil)	Refer to SOP-15c	Refer to SOP-15c
Metals** – laboratory	EPA 6010B or EPA 6020	Refer to SOP- 7b & 8b	Refer to SOP 7b & 8b	Refer to SOP 7b & 8b	Refer to SOP 7b & 8b
PCBs – Laboratory	EPA 8082	Refer to SOP-6b	Refer to SOP-6b	Refer to SOP-6b	Refer to SOP-6b
SVOCs – laboratory	EPA 8270C	Refer to SOP-2b	Refer to SOP-2b	Refer to SOP-2b	Refer to SOP-2b
VOCs – laboratory – soil, groundwater	EPA 8260B	Refer to SOP-1b	Refer to SOP-1b	Refer to SOP-1b	Refer to SOP-1b
VOCs – laboratory – air	EPA TO15	Refer to SOP-10b	Refer to SOP-10b	Refer to SOP-10b	Refer to SOP-10b

* Form F-1, contains the Method and SOP Reference Table.

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Form M-1
Field Quality Control Requirements

QC Sample	Frequency	Acceptance Criteria	Corrective Action
Confirmation Sample	1 per 10 to 20 immunoassay samples	$\pm 30\%$ Relative Percent Difference (RPD) between field and laboratory data	Document in report
Duplicate Sample	at least 1 per parameter for soil vapor and groundwater laboratory samples	Duplicate results have an RPD of less than or equal to 30%	Reanalyze samples
Aqueous VOA Trip Blank	1 per Cooler	No reported VOC concentrations above the quantitation limit	Review storage and handling procedures. Alter procedures as necessary
Equipment Blank	1 per batch VOC water samples	No reported VOC concentrations above the quantitation limit	Review sample handling and decontamination procedures. Alter procedures as necessary.
Cooler Temperature Blank	1 per Cooler	$4 \pm 4^{\circ}\text{C}$	Documentation on the laboratory report. Alter packing and shipping procedures as required.

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Form M-2
Laboratory Quality Control Requirements

QC Item	Frequency	Methodology	Acceptance Criteria	Corrective Action
Method Blank	1 per 20 samples	Method blank subjected to same reagents and procedures as a field sample	Concentrations of all constituents less than 1/2 of each respective reporting limit or if greater than reporting limit, samples must be below reporting limit	Redigest samples with new method blank and reanalyze for analyte
Matrix Spike / Matrix Spike Duplicate – if volume permits	1 per 20 samples (or 1 per matrix type) during an analytical run	Field sample is spiked with known concentration of analyte(s)	Matrix spike sample results between 75% and 125% of actual concentrations; RPD between MS and MSD < 20-25%	Deviation noted on report
Lab Control Sample / Lab Control Sample Duplicate	1 per 20 samples or 1 per matrix batch, run immediately after method blank but before samples digested within same batch	Reagent water or a blank matrix is spiked with a known concentration of analyte(s); purpose is to determine if possible MS/MSD failure was result of matrix issues or other procedural issues	Matrix spike sample results within $\pm 20\%$ of actual concentrations unless it failed high and all samples concentrations were below the reporting limit	Analyte may not be reported without a narrative, rerun batch
Initial Calibration	After failure of Continuing Calibration Verification or after instrument maintenance	1 standard (ICP) or 3 standards (ICP-MS) or Internal standard 5 point average RF if < 15% RSD or Linear reg. If > 15% RSD (GC/MS)	Recoveries must be within ± 10 to $\pm 20\%$ (depending on instrument) to continue with analysis	Terminate analysis and recalibrate
Interference Check Standards – metals only	Beginning and end of analytical run or twice per 8-hour work shift	Contain known concentrations of interfering elements and analytes	Recovery must be within $\pm 20\%$	Reanalyze and recalibrate

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Form M-2 continued
Laboratory Quality Control Requirements

QC Item	Frequency	Methodology	Acceptance Criteria	Corrective Action
Calibration Check Standards -- metals only	One per 10 samples	Solutions with 0.01 ppm and 0.10 ppm of analyte for low level, another at upper end of linear range	Solutions must be within $\pm 20\%$ for low level, within $\pm 10\%$ at upper range	Reanalyze standards; if still unacceptable, terminate analysis and recalibrate
Linear Dynamic Range (LDR) -- metals only	May be run prior to samples but not usually run until sample concentrations exceed highest standard for the analyte	50.0 ppm calibration check standard to verify concentration range over which analytical curve remains linear	Recovery must be $\pm 10\%$ for linearity up to 50.0 ppm	Dilute samples more concentrated than linear calibration limit
Dilution Test -- metals only	One per 20 samples	Five fold dilution performed on a sample	Results must agree within $\pm 10\%$ of the original determination	Reanalyze samples
Continuing Calibration Verification	One per 10 samples (1 per 12 hours for GC/MS)	Analysis of a standard with known concentration of analyte(s)	Sample results between 80% and 120% of actual concentrations	Rerun CCV; if still not acceptable, terminate analysis, correct problem, recalibrate, reanalyze previous 10 samples

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Form N
Data Management and Documentation

Data management will be maintained in an organized manner to minimize data interpretation errors and omissions.

A field book will be used to compile information collected during the field work portion of the project and will include the following information: sampling conditions, observations, deviations from SOPs and QAPP, and physical parameter data as required during sampling. When applicable, sampling forms will be used to document sampling activities.

At the analytical laboratory, samples are to be recorded in a permanently bound sample log-in notebook and a laboratory notebook, specific for each instrument. The laboratory will provide Level "B" reporting, which includes sample data, chains of custody, surrogate data, QA/QC narratives, and data pertaining to blanks, matrix spikes, laboratory control samples, duplicate samples, and matrix spike duplicate samples. Complete data packages will be provided for all samples analyzed by EAI and STL. The data reports will be reviewed by the project QA officer to ensure chain-of-custody documents are completed correctly, all analyses were performed within holding limits, and that QA/QC samples meet acceptance criteria.

All data will be entered into an electronic database. The data entry will be checked by comparing a print out of the electronic data with the laboratory data reporting sheets by a second party at JCO to ensure accurate data entry. Any corrections will also be reviewed for accuracy. All documents will be filed in the JCO master file room.

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Form O
Assessment and Response Actions

Field tasks:

During all field activities, the field team is responsible for completing all tasks in accordance with specified methods and SOPs. If a task is performed in a way that deviates from specified methods or SOPs, the field team will complete a Deviation Form (example attached) describing the method/SOP deviation, the rationale for the deviation, and any corrective actions which may be required. These deviations forms will be submitted as soon as possible to the QA officer for review. If the deviation results in serious consequences in data integrity, the project manager may require corrective actions, such as collecting and analyzing additional samples.

If any unexpected circumstances are encountered in the field, the project manager will be contacted immediately prior to proceeding with the field investigation.

Field tasks will be overseen and documented by Rhonda Kay, Staff Engineer for this project.

Laboratory tasks:

The analytical laboratory is responsible for ensuring all lab tasks are completed in accordance with all methods and SOPs. The laboratory must maintain its certification with the EPA and State of Vermont throughout the course of the project.

Modifications to QAPP:

All major modifications to this QAPP must have prior approval by the EPA Project Manager, Dorrie Parr.

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*Quality Assurance Unit
Record of
(Check One)*

- ☐ A. *Deviation from Protocol or Standard Operating Procedure*
or
☐ B. *Notation, Correction and Documentation of Unforeseen Circumstances*

Ref: 40 CFR § 160.81, § 160.33 and § 160.35 and SOP-JCO-018

Date(s) of Occurrence:

Study Designation:

Study Location:

Test substance:

CAS No.:

Study Sponsor:

Study phase (or segment):

Site of problem:

Scientist, engineer or technician:

Initials: _____ Date: _____

Findings:

Weather: °F; Sky: Clear, Partly Cloudy, Cloudy, Fair, Rain, Snow; Wind-

List: Personnel, Visitors, Contractors:

Equipment (e.g. Permeameter, Data Logger, Drill rig, Dozer):

Protocol title, date and section number:

Standard Operating Procedure title:

SOP No:

Type of deviation (inadvertent or planned):

Nature of deviation or unforeseen circumstance:

Observations:

Problems:

FORM.005

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(Instruction: Number paragraphs consistent with the numbers of items listed under Procedure A or B in SOP-JCO-018. Begin with No. 2. Sheet 1 of this report addresses Item No. 1.)

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Initials:

Date:

Report Prepared by: _____ Date _____
Scientist, Engineer or Technician

Authorized by: _____ Date _____
Study Director/Project Manager

Reviewed by: _____ Date _____
Vice President

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Form P
Project Reports

A Phase II Environmental Site Assessment report will be produced following the conclusion of all site investigation activity. This report will document the results of all soil vapor, groundwater and soil sampling activities conducted at the two subject properties. Field and laboratory analytical data will be tabulated and, if appropriate, displayed visually on site plans. Laboratory narratives and field deviation reports will also be included in the report.

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Form Q-1
Verification of Sampling Procedures

The verification of the actual sampling procedures used will be performed by the QA/QC officer and the Project Manager (PM). All field notes, sampling forms, and deviation forms will be reviewed for errors and omissions. The field team will be in contact with the PM daily to discuss sampling procedures/events to minimize the chance that errors go undetected.

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Form Q-2
Data Verification and Validation

All analytical data generated by the analytical laboratory will be reviewed for data completeness by Chad Farrell, P.E., of the Johnson Company. Mr. Farrell's review will include checking holding times, proper chain-of-custody documentation, acceptable detection limits, surrogate recoveries, duplicate results, and MS/MSD results. The results of each component of the data review will be summarized in the final report. A table summarizing the QC results will be included as well as any revisions or qualifiers deemed necessary.

As part of the data valuation process, a table will be presented comparing data from the various sources including PID, field analytical and EAI fixed laboratory results. A discussion of this comparison will also be provided.

All analytical reports from the JCO field laboratory will be reviewed for completeness and accuracy by the QA/QC officer. This review will also include a comparison summary of the JCO field results and the fixed laboratory confirmation results of duplicate samples as a measure of accuracy of the field-generated data.

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Form R **Data Usability**

Based on the data verification/data validation process described on forms Q-1 and Q-2, a determination on the usability of the data will be made. If deviations are identified which may cause data to be unusable, additional samples may be collected and reanalyzed to provide useable data. The data set for the project will be considered useable if no more than 10% of the collected data is rejected.

A summary of each of the components of the Data Usability assessment will be included in the final report and will include an assessment of the results of the data validation process. For example, a statement will be made confirming that the analytical laboratory's reporting levels are below VT GWES and EPA Region 9 PRGs. Any deviations or specific data qualifications identified by the data validator will be addressed in terms of how those deviations affect the decision making process at the site.

If no significant deviations are identified, the data will be used to complete the required reports as specified on Form P.

APPENDIX 1
ANALYTICAL METHOD SOPs

APPENDIX 2
PROJECT SAMPLING SOPs

APPENDIX 3
QUALITY ASSURANCE MANUAL